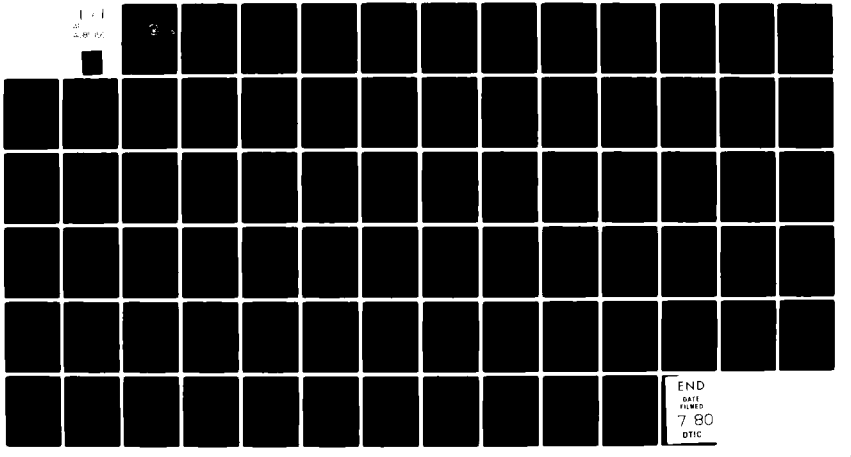
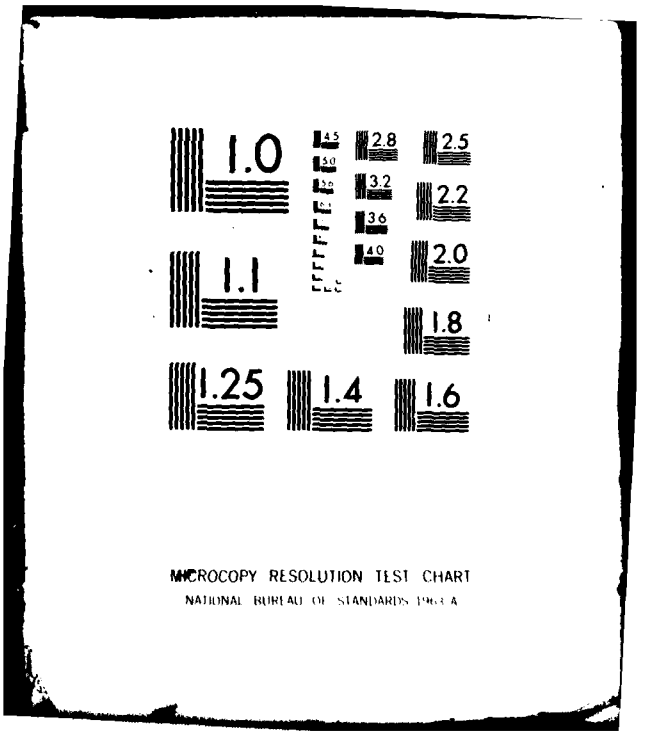
AD-A085 150 NAVAL POSTGRADUATE SCHOOL MONTEREY CA F/G 5/9
AN APPLICATION OF HUMAN RESOURCE ACCOUNTING TO THE ANALYSIS OF --ETC(U)
MAR 80 C T ROCK

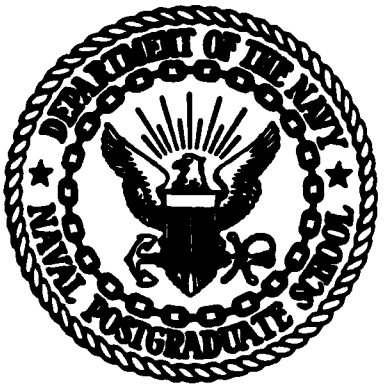
UNCLASSIFIED NL



END
DATE FILMED
7 80
DTIC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

NAVAL POSTGRADUATE SCHOOL
Monterey, California



THESIS

AN APPLICATION OF HUMAN RESOURCE ACCOUNTING TO THE ANALYSIS OF COMMISSIONING PROGRAM EFFECTIVENESS IN THE U.S. ARMY

by

Clifford T. Rock, Jr.

March 1980

Thesis Advisor: K. J. Euske

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A085150
3. RECIPIENT'S CATALOG NUMBER (9)	
4. TITLE (and Subtitle) (6) An Application of Human Resource Accounting to the Analysis of Commissioning Program Effectiveness in the U.S. Army	5. TYPE OF REPORT & PERIOD COVERED Master's Thesis; March 1980
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) (10) Clifford T. Rock, Jr	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940 (11)	12. REPORT DATE Mar[illegible] 1980
	13. NUMBER OF PAGES 78
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) (12) 79	15. SECURITY CLASS. (of this report) Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Human Resource Accounting (HRA)
Human Resource Valuation
U.S. Army Commissioning Programs
Regular Army
Human Capital Theory

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The purpose of this study was to demonstrate the relative effectiveness of the three major Regular Army (RA) commissioning training sources based on the performance of the graduates of each source. The historical development of human resource accounting (HRA) was traced from its origins in the Labor Theory of Value and Human Capital Theory. The present state of HRA measurement research was examined. Criteria for selection of a human resource investment model were discussed. A human resource valuation →

DD FORM 1 JAN 73 1473 (Page 1)
EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601

UNCLASSIFIED 25145
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

LB

#20 - ABSTRACT - CONTINUED

model (HRVM) was adapted from prior research and applied to the measurement criteria of the study. A set of models were developed to measure the Army's human resource investments in the RA Maneuver Combat Arms officers commissioned from the USMA, ROTC, and OCS in calendar years 1952 and 1954. The Army's monetary investments in graduates of each source were calculated based on historical retention and promotion data. The results of the study were mixed; however, given specific assumptions, the ROTC offered the highest relative return for the cohorts considered.

Approved for public release; distribution unlimited.

An Application of Human Resource Accounting to the Analysis of Commissioning Program Effectiveness in the U.S. Army

by

Clifford T. Rock, Jr.
Captain, United States Army
B.S., United States Military Academy, 1969

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
March 1980

Author Clifford T Rock

Approved by: K O Emery
Thesis Advisor

Richard A. Elster
Second Reader

Chairman, Department of Administrative Sciences

Dean of Information and Policy Sciences

ABSTRACT

The purpose of this study was to demonstrate the relative effectiveness of the three major Regular Army (RA) commissioning training sources based on the performance of the graduates of each source. The historical development of human resource accounting (HRA) was traced from its origin in the Labor Theory of Value and Human Capital Theory. The present state of HRA measurement research was examined. Criteria for selection of a human resource investment model were discussed. A human resource valuation model (HRVM) was adapted from prior research and applied to the measurement criteria of the study. A set of models were developed to measure the Army's human resource investments in the RA Maneuver Combat Arms officers commissioned from the USMA, ROTC, and OCS in calendar years 1952 and 1954. The Army's monetary investments in graduates of each source were calculated based on historical retention and promotion data. The results of the study were mixed; however, given specific assumptions, the ROTC offered the highest relative return for the cohorts considered.

TABLE OF CONTENTS

LIST OF TABLES

I. INTRODUCTION

The consideration of humans as factors in economic production traces its origins to the Labor Theory of Value conceived by 18th and 19th Century economists. They proposed that commodities be valued in accordance with the amount of labor necessary for their production. The maturing impetus of that economic notion led a century later to the more specialized study of Human Capital Theory. Within Human Capital Theory labor is valued as the amount of capital invested in a worker and the anticipated benefits to be returned to society from that investment.

The quantification and prediction of these values stimulated the interest of accounting theorists, who sought to measure such economic events and their implications to formal organizations. The evolution of that theory produced the idea of Human Resource Valuation. Successive refinements eventually led to a branch of accounting known as Human Resource Accounting (HRA). Within HRA an organization's human work-force is regarded as a commodity to be valued according to a firm's investment in employee recruitment, education, training, and compensation. The amount of these investments is then used as a basis upon which future benefits to the firm are predicted.

Although the primary focus of HRA has been directed to the private sector, its potential application to government

organizations is no less consequential. The U.S. Army, as the military service with the highest ratio of manpower to capital equipment in the Department of Defense, faces an especially critical problem in seeking the maximum return on its substantial investments in human resources.

This study considers the attrition of commissioned officers from the Army as a loss of human resources and examines the relative rate of return on the investment in human resources of the three primary sources of commissioning.

II. HUMAN RESOURCE ACCOUNTING

A. ECONOMIC ORIGINS

Accounting for people as an organizational resource in much the same way as more traditional accounting methods have dealt with other organizational assets is the underlying philosophy of the HRA approach. The concept traces its origins to the general economic idea of the valuation of human labor as expressed in the Labor Theory of Value by the economists Adam Smith and David Ricardo. They proposed that goods are exchanged in the marketplace in accordance with the amount of labor required in their production. Smith (1776) stated:

> The annual labour of every nation is the fund which originally supplies it with all the necessaries and conveniences of life which it annually consumes, and which consist always either in the immediate produce of that labour, or what is purchased with that produce from other nations. (p. 5)

Ricardo (1817) further proposed that "The value of a commodity ... depends on the relative quantity of labour which is necessary for its production, and not on the greater or less compensation which is paid for that labour" (p. 11).

Armed with the idea of the value of human labor in generating economic benefit to the individual firm, theorists began to view an organization's human workforce as a cornerstone of all other productive assets. Fisher (1906), who investigated the relationship between capital and income,

contributed significantly to the analytical framework constructed by later economists. Knight (1944) examined the relationship between improvements in the quality of the labor force and a firm's return on that investment. Mincer (1958) continued the thrust of earlier research by integrating human capital and income distribution theories, and formulated a set of valuation models incorporating schooling, experience, and earnings as variables in determining the ultimate value of human resources.

B. HUMAN RESOURCE ACCOUNTING

Accounting and other social science researchers attempted to more fully describe and measure the economic events delineated in Human Capital Theory. Becker (1964), Denison (1962), Kendrick (1961), and Likert (1958) investigated the relationship between a firm's investments in the education and training of its work force and employee productivity. They generally concluded that a firm could not disregard the importance of such investments in the generation of income.

Brummet, Pyle, and Flamholtz (1968) defined HRA as the process of identifying, measuring, and communicating information about human resources to facilitate effective management within an organization. In its 1973 Report, the Committee on Human Resource Accounting of the American Accounting Association (AAA) identified three apparent objectives of HRA:

1. Measurement: The development of models and methods for measuring the cost and value of people to organizations,

2. Applications: The design of operational systems to implement these measurement methods in actual organizations, and

3. Cognitive and behavioral impact: To determine the behavioral impact of the HRA measurements and frameworks on human attitudes and behavior (i.e., decisions and performance) [AAA, 1973, pp. 169-85].

The first and second objectives deal with the problem of the valuation of human resources, and are directly related to the analysis conducted in this study. The third objective is concerned with the behavioral questions that emerge when the valuation is undertaken, and is beyond the scope of this study.

C. HRA MEASUREMENT RESEARCH

This section discusses valuation methods which have resulted from HRA research.

HRA measurement research may be classified into cost based and value based [Ogan, 1976a]. Cost based measurements, as developed by Brummet, Flamholtz, and Pyle (1969) are concerned primarily with the historical costs incurred by an organization for the recruiting, training, and compensating of its employees. Such historical cost based measurements attempt to represent the firm's investment in

its human resources. Additionally, Flamholtz (1974) conceived an HRA system designed to measure positional replacement cost using current employee acquisition, training, and attrition costs as major cost factors. Value based measurements, as defined by Flamholtz and Lundy (1975), are the discounted present value of future incomes expected to be earned by an employee. Flamholtz and Lundy also introduced the notion of employee expected conditional value. It is defined as the value of a person who reaches maximum potential and reamins with the firm until normal retirement. This is contrasted to employee expected realizable value, which is defined as the value of a person who leaves the firm prior to normal retirement. The primary distinction between these two values is the probability of pre-retirement employee turnover.

An HRA literature survey conducted by Puett and Roman (1976) identified additional HRA valuation methods. One method is that proposed by Hekimian and Jones (1967). The method suggests two possible ways of determining the value of an employee: 1) by using the capitalized value of the individual's salary, or 2) by using the value of an individual's talents based on their scarcity in the labor market.

The different measurement techniques proposed offer managers alternative methods to capture both the amount of investment in human resources and the expected returns from those investments.

D. PURPOSE OF THE STUDY

The Army presently procures officers from three major commissioning training sources: 1) Officer Candidate School (OCS); 2) the Reserve Officer Training Corps (ROTC) and 3) the U.S. Military Academy (USMA). The costs of these programs differ widely [GAO, 1975]. The USMA, in particular, has been the subject of considerable scrutiny with regard to training costs, pre-graduation attrition, and graduate retention on active duty. Canby (1972) questioned not only the high costs of a USMA education, but challenged the need for college trained officers in non-technical specialties. Ellis and Moore (1974), Glick (1971), and Heise (1969) criticized the high costs incurred in producing USMA graduates in light of the apparently less costly alternatives provided by ROTC and OCS. Galloway and Johnson (1973) expanded on earlier cost concerns and questioned the motivation and influence of USMA graduates in the Army.

Pre-graduation attrition, training methods, graduate retention on active duty, and the high costs of USMA in comparison with other commissioning sources were the focus of attention in a comprehensive report prepared by the General Accounting Office (GAO) [GAO, 1975]. This formed the basis for later hearings conducted by the U.S. House of Representatives [U.S. House of Representatives, 1976].

Although these inquiries focused on the costs of each commissioning source and briefly surveyed the problem of USMA graduate retention, they did not compare the returns

to the Army of each source as a function of costs. What was not demonstrated was the relative effectiveness of each source compared to the training, salary, and fringe benefit investments in the graduates of each source. This study is an attempt to demonstrate the relative effectiveness of each source based on the performance of its graduates.

In seeking to measure officer effectiveness, the Army compares actual performance to desired performance. Desired performance is extended active service to the Army in positions of increasing responsibility [DA, 1979]. The measure of commissioning source effectiveness considered in this study is the attainment of desired performance by the graduates of each source, as determined by graduate retention and promotion.

This study evaluates the Army's relative rate of return on its investment in human resources. A model drawn from HRA research [Ogan, 1976b] is utilized to evaluate the Army's investment in the regular army (RA) maneuver combat arms (MCA) graduates of each source. The MCA are Infantry, Armor, Field Artillery, and Air Defense Artillery.

III. MEASURING THE INVESTMENT IN HUMAN RESOURCES

This chapter presents the HRA valuation model utilized in this study. The criteria used to select the model are discussed. The method for calculating the monetary amounts of the Army's invesment in human resources is explained. The model is then selected and the model variables are discussed.

A. CRITERIA

The valuation model selected was required to meet seven essential criteria developed for this study: 1) it must include a measure of the recruiting and training costs; 2) it must include a measure of the costs of continuing professional education and training; 3) it must include a measure of the costs of salaries and fringe benefits; 4) it must include a measure of the value of retirement annuities; 5) it must include the probability of retention in the organization; 6) it must include the quality of employee performance; and 7) it must be applicable to a hierarchically structured, service-oriented organization whose members perform prescribed tasks within well-defined levels of responsibility. These seven criteria provide a means to evaluate the major dimensions of the total investment in and, therefore, the value of an employee to an organization [Flamholtz, 1974].

The first and second criteria are measures of the Army's monetary investment in an officer prior to commissioning

and after entry on active duty. The third and fourth criteria measure the monetary amount of the income stream paid to an officer during that officer's career and after retirement from active duty, and are an expression of the worth of an officer's services as perceived by the Army. The fifth criterion, adjusts the ultimate amount of the income stream to account for varying lengths of individual service, since the amount of salary, fringe benefits, and the retirement annuity is contingent upon when an officer leaves the Army. Similarly, the potential costs for future education and training are obviated when an officer leaves the Army. The sixth criterion influences the probability of an officer's retention on active duty. A history of poor performance will prevent promotion to higher grades and ultimately result in involuntary separation from the Army. The seventh criterion is necessary for the identification of a model that will be applicable to the structure of the army.

B. MODEL SELECTION

The first three of the seven selection criteria were met by a method that was utilized for the initial application of HRA at the R.G. Barry Corporation in 1966. Brummet, Flamholtz, and Pyle (1969) documented that application, which was based on the premise that the costs incurred in recruiting, training, developing, and maintaining employees represent an organization's investment in its human resources. The major limitation of the R.G. Barry application, in terms of this

study's selection criteria, was its failure to consider the value of an employee's retirement annuity, the quality of employee performance, the probability of employee retention with the firm, or its applicability to the structure and mission of the Army.

Subsequent research into possible valuation models and their application to operational organizations [Alexander, 1971; Carper, 1973; Flamholtz, 1972, 1973, 1974 and Flamholtz & Lundy, 1975] focused on three input quantification methods: 1) historical cost measurement; 2) positional replacement cost; and 3) individual employee valuation. In a refinement of these earlier attempts, Ogan (1976b) operationalized a human resource valuation model (HRVM) at a certified public accounting firm, using individual employee valuation as the primary input measurement. The major model determinants used were: 1) monetary value benefit potential; 2) an individual performance index comprised of an efficiency index and a standard work index; 3) maintenance costs (i.e., salaries and wages); 4) start-up costs (i.e., recruiting and initial training); 5) training and development costs; 6) the probability of continued employment; and 7) the probability of survival. The determinants were utilized to compute a net monetary benefit and a certainty factor. The net monetary benefit was multiplied by the certainty factor and converted to periodic certainty equivalent net benefits. Considering the time value of money, the periodic certainty

equivalent net benefits were discounted and aggregated to arrive at the adjusted net present value patterns of an employee for the organization. Ogan's HRVM is shown schematically in Figure 1.

Although Ogan's HRVM was applied to the valuation of employees in the private sector, its comparison with the essential model criteria of this study reveals a direct applicability. Table 1 presents the relationship between Ogan's model determinants and the valuation model criteria of this study. Table 1 shows two areas of disagreement between Ogan's HRVM and the study critiera: 1) the model selection criteria includes the value of an officer's retirement annuity, whereas Ogan's model does not; and 2) the model selection criteria do not include an employee's monetary value benefit potential, whereas Ogan's model does. Ogan's model was accepted as the basic model with some modifications.

The extent to which Ogan's determinants meet the model selection criteria is discussed below. Additionally, the means by which the determinants in Ogan's application and the determinants used in this study were measured are discussed.

1. Recruiting and Training Costs

Recruiting and training costs are those incurred by the Army as a result of the recruiting and pre-commissioning training of an officer candidate. Ogan defined these costs as start-up costs.

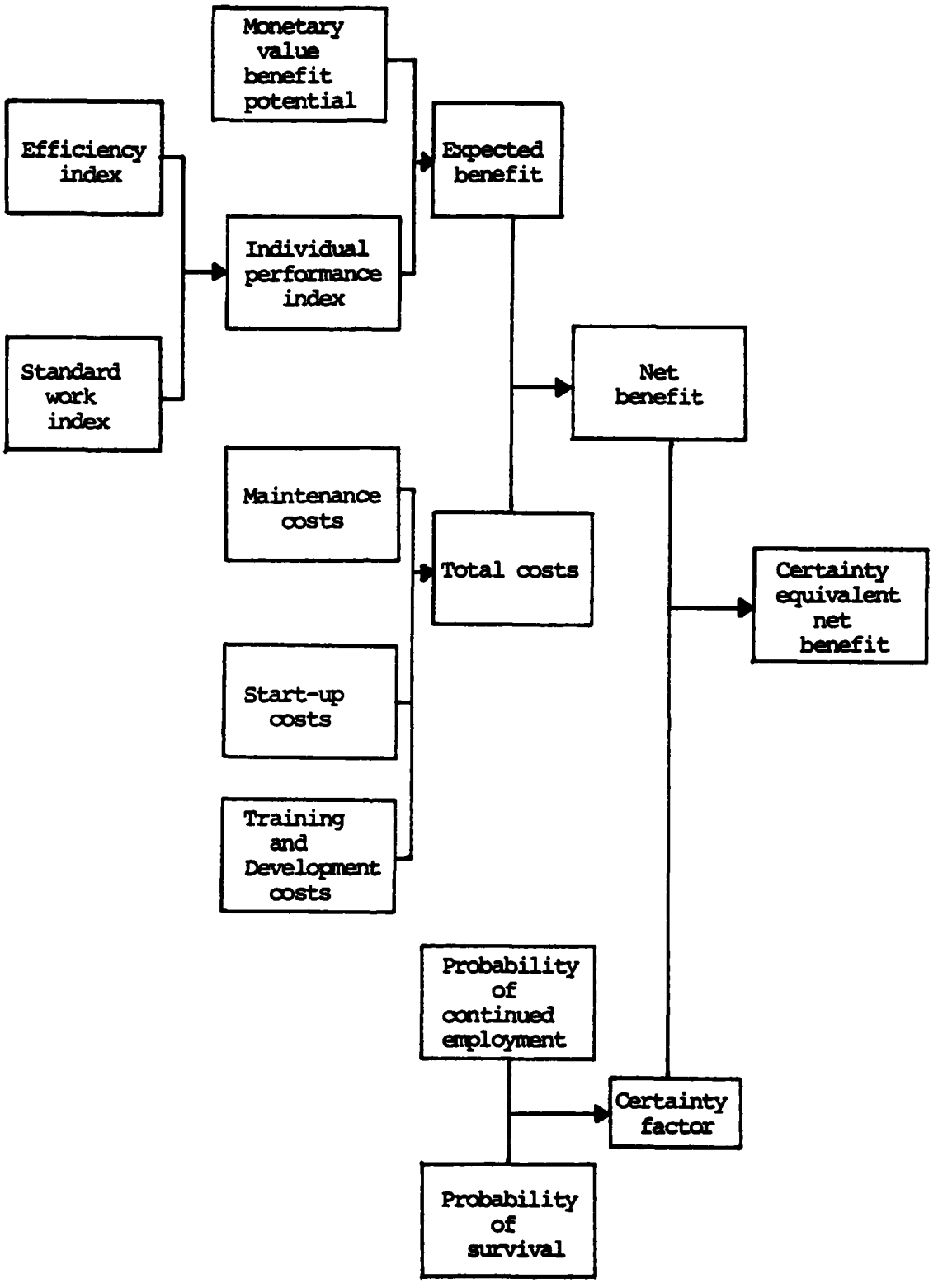


Figure 1. Major determinants of the human resource value model

Table 1

Comparison of Study Criteria and Ogan's HRVM Determinants

	Study Criteria	Ogan's HRVM Applicable	Ogan's HRVM Determinant(s)
1)	Measurement of recruiting and training costs	Yes	Start-up costs
2)	Measurement of costs of continuing education and training	Yes	Training and Development costs
3)	Measurement of costs of salaries, cash supplements, and fringe benefits	Yes	Maintenance costs
4)	Measurement of retirement annuity value	No	None
5)	(a) Considers probability of retention on active duty	Yes	Probability of continued employment
	(b) Considers probability of survival	Yes	Probability of survival
6)	Considers quality of officer performance	Yes	Individual performance index
7)	Compatability with Army organizational structure	Yes	None
8)	None	No	Monetary value benefit potential

Ogan did not attempt to measure these costs because no formal records were available in the firm he studied. The Army, however, makes such costs a matter of record [DMC, 1976]. In this study, recruiting and training costs were measured by computing the monetary amounts incurred by the Army in the recruiting and training process prior to commissioning. Such costs were allocated to a commissioning source and treated as the cost of producing an officer from a particular source. The cost for each pre-commissioning source program includes recruiting publicity; installation operation; logistical support; uniforms; transportation; training materials; personnel support, including instructor's salaries; and candidate salaries. The costs incurred by those who fail to complete a pre-commissioning source program were also allocated to the total costs of producing each graduate [U.S. House of Representatives, 1976]. The cost data for each commissioning source were obtained from the Office of the Deputy Chief of Staff for Personnel (DCSPERS), DA, and are expressed in 1979 dollars.

2. Continuing Education and Training

Continuing education and training costs are those incurred by the Army incident to formal education and training after commissioning. Ogan defined these costs as training and development costs.

Ogan measured these costs by recording the expenses associated with educational, training, and executive

development programs that employees should be expected to attend. The costs of tuition, travel, living expenses, training and program supplies were allocated to the training and development costs determinant.

In this study, in which costs actually incurred rather than expected costs were used, continuing education and training costs were measured by computing the monetary amounts incurred by the Army as the result of officer attendance at basic and advanced branch (occupational specialty) courses, the Command and General Staff College (C&GSC), and the Army War College (AWC). Logistical support, training materials, and personnel support costs were allocated to the total continuing education and training cost. The cost data were obtained from the U.S. Army Training and Doctrine Command (TRADOC), and are expressed in 1979 dollars.

3. Salaries, Fringe Benefits, and the Retirement Annuity

Salaries, fringe benefits, and the retirement annuity are three components of the total monetary compensation paid by the Army to its officers. Each component is discussed separately, then compared to Ogan's maintenance cost determinant.

Military salary is comprised of two components: 1) basic pay, which is the base amount of military compensation; and 2) cash supplements. Cash supplements are quarters and subsistence allowances and the tax advantage resulting from the exemption of quarters and subsistence allowances from income tax assessment. Canby (1972) calculated the value

of cash supplements as 4.1 percent of basic pay. Military salary increases with progression in rank and increased years of active service.

Military fringe benefits are defined as medical care, and commissary and retail exchange store privileges, and comprise 14.9 percent of basic pay [Canby, 1972]. Non-compensation items of military pay that are associated with special job-related risks (e.g., hostile fire pay), or are situational in nature (e.g., family separation allowances), are not considered in this study.

The military retirement annuity is the largest component of military compensation after basic pay [Canby, 1972]. A military member attains retirement eligibility upon completing 20 years of active federal service, and draws retirement pay until death. The annuity is calculated at 2.5 percent for each year of active federal service and multiplied by the terminal basic pay. The maximum annuity amount is 75 percent of terminal basic pay, and is reached at the completion of 30 years of active federal service [DOD, 1969].

Ogan's comparable determinant, maintenance costs, was defined as the monetary value of salaries and fringe benefits which would accrue to an employee as the result of promotions to higher levels of responsibility in the firm, and was measured by the total compensation paid to each employee. Ogan did not, however, account for the value of an employee's retirement annuity in his measurement of maintenance costs.

Since the deferred compensation offered by the military retirement system is a large portion of the fringe benefits offered by the Army to career officers, it was included in this study. Moreover, Ogan's estimate of maintenance costs in the firm he studied were measured according to management's perception of each employee's promotion potential, and the salary increases that would result from promotions. The comparable costs for each Army officer were not based on the present perception of promotion potential and attendant salary increases on the part of superiors. They were based instead on the past record of performance and promotion potential, as recorded on Officer Evaluation Reports (OER) by previous superiors and represented by actual promotions. The accumulation of a number of OER prior to each promotion and retention decision affords a measurement basis less subject to short-term fluctuation and individual supervisor perceptions than that utilized by Ogan. Additionally, this study measures historical rather than purely predictive data.

Military salary data were obtained from tables published by the U.S. Army Finance and Accounting Center (USAFAC). The current values of cash supplements, fringe benefits, and retirement annuities were computed from USAFAC military salary data.

4. Probability of Retention on Active Duty

The probability of the retention of an officer on active duty is defined as the probability that, once commissioned, an officer will remain on active duty until normal

retirement. The definition for the model selection criterion and the determinant in Ogan's model are identical.

Ogan's data were gathered from employee satisfaction surveys and management's expectations that employee satisfaction and attitude toward changes in the organizational environment were indicators of the probability of remaining with the firm. Ogan used, therefore, management's opinion of the probability of continued employement with the firm for each employee.

The measure of retention probability used in this study is different from Ogan's. The measure used here is the probability of retention on active duty until normal retirement for each officer, based on historical records. The data were taken from historical retention data, drawn from the Register of Graduates of the USMA, published annually by the Association of Graduates, USMA; and the Official Army Register, published annually by the Office of the Adjutant General, U.S. Army.

5. Probability of Survival

The probability of survival is defined as the probability that an officer will remain alive for the period of time known as the average lifetime. The average lifetime for the officers considered in this study was defined by the Division of Vital Statistics, U.S. Public Health Service, as 65.6 years [TWA, 1978]. The definition for the model selection criterion, and the determinant in Ogan's model are identical; however, the data used in this study

were drawn from a different source. Ogan's data were based on the Commissioner's 1958 Standard Ordinary Mortality Table [CRC, 1964]. The probability of survival for each Army officer was measured by tables provided by the Army Mutual Aid Association (AMAA). The AMAA, which insures only Army officers, recognizes the combat exposure of its younger members by using a special mortality table through age 59 [AMAA, 1979] based on the American Experience Mortality Table. At age 60, the AMAA reverts to the Commissioner's 1958 Standard Ordinary Mortality Table. Although the special table recognizes the combat exposure of younger officers, no differences between members in the MCA and other branches are considered [Hanst, 1979].

6. Quality of Performance

Quality of performance is defined as how well individuals do at their jobs [Vroom, 1960]. In assessing the quality of employee performance, Ogan used an individual performance index determinant, which contained two components: 1) the efficiency index; and 2) the standard work index. The efficiency index is defined as an employee's efficiency in theperformance of a given task. The standard work index is defined as the type of work an employee should perform according to that employee's position in the firm.

The efficiency index was measured by management's perception of each employee's efficiency in the performance of a given task and intuitive feelings regarding the future performance of each employee. The standard work index

measurement was based on the subjective expectations of management as to the type of work an employee should perform, given the employee's position.

In this study, the quality of performance was measured by utilizing the results of the Army's Officer Evaluation System (OES); that is, the promotion decision. The quality of an officer's past performance and promotion potential are recorded on OER, which form the basis of the OES. OES, in turn, is the basis for promotion decisions. Under OES, superiors evaluate an officer's performance and promotion potential at least annually. The proper range of an officer's activities, expressed as a duty position description, is included in each evaluation. The accumulation of a number of OER prior to each promotion determination affords a long-term picture of each eligible officer's potential for promotion [DA, 1979].

7. Compatability with Army Organizational Structure

The firm in Ogan's study was structurally similar to the Army. Both organizations have pyramidal structures with clearly defined levels of authority; both provide services rather than the manufacture of goods; and the members of both organizations perform prescribed tasks according to levels of authority and responsibility defined by the organization. Additionally, both organizations are characterized by entry level positions from which new members progress to increased levels of salary, authority and responsibility.

The resulting similarities provide a basis for consistent measurement of the investments made by each organization in its human resources.

8. Consideration of Monetary Value Benefit Potential

Ogan's determinant is defined as the maximum benefits an employee can generate for the organization. It was measured by the billing rate multiplied by the chargeable hours of each employee. Similarly, each officer in the Army can be thought of as generating benefits in terms of national defense; however, the full development and operationalization of a concept such as "contributions to national defense" is beyond the scope of this study. This determinant was, therefore, excluded.

C. THE AGGREGATE VALUATION MODEL

The complete investment valuation model, adapted from Ogan's HRVM, for a cohort of officers may be expressed as:

$$\underline{I}_{ik} = \underline{C}_{ik} + \underline{O}_{ik} + \underline{T}_{ik} + \underline{W}_{ik} \qquad (1)$$

where:

$\underline{I}_{ik}$ = The time adjusted value of the total investment in a cohort of officers commissioned in year "k" from source "i";

$\underline{C}_{ik}$ = The time adjusted value at the time of commissioning of the total recruiting and training cost of a cohort of officers commissioned in year "k" from source "i";

$\underline{Q}_{ik}$ = The time adjusted value at the time of commissioning of the cost of continuing education and training of a cohort of officers commissioned in year "k" from source "i";

$\underline{T}_{ik}$ = The time adjusted value at the time of commissioning of the cost of total military compensation (base pay, cash supplements, and fringe benefits) of a cohort of officers commissioned in year "k" from source "i"; and

$\underline{W}_{ik}$ = The time adjusted value at the time of commissioning of the retirement annuity of a cohort of officers commissioned in year "k" from source "i".

For a cohort of officers commissioned in year "k" from source "i", the time adjusted value of the commissioning cost, $\underline{C}_{ik}$, may be expressed as:

$$\underline{C}_{ik} = \sum_{p=1}^{n} (\underline{V}_{ip} \cdot \underline{X}_i)(1+r)^{n-p} \qquad (2)$$

where:

n = The number of periods over which the training is received;

p = The period training;

$\underline{V}_{ip}$ = The recruiting and training cost for source "i" in period "p";

$\underline{X}_i$ = The number of MCA RA officers commissioned from source "i"; and

r = The discount rate.

For a cohort of officers commissioned in year "k" from source "i", the time adjusted value of the cost of continuing education and training, $\underline{Q}_{ik}$, may be expressed as:

$$\underline{Q}_{ik} = \underline{D}_i + \underline{E}_i + \underline{F}_i + \underline{H}_i \qquad (3)$$

where:

$\underline{D}_i$ = The time adjusted value at the time of commissioning of the cost of the basic branch course for officers from source "i";

$\underline{E}_i$ = The time adjusted value at the time of commissioning of the cost of the advanced branch course for officers from source "i";

$\underline{F}_i$ = The time adjusted value at the time of commissioning of the cost of the C&GSC for officers from source "i"; and

$\underline{H}_i$ = The time adjusted value at the time of commissioning of the cost of the AWC for officers from source "i".

The time adjusted value at the time of commissioning of the cost of the basic branch course for officers from source "i" may be represented as:

$$\underline{D}_i = \frac{\underline{P}_{it} \cdot \underline{X}_{ik} \cdot \underline{S}}{(1 + r)^t} \qquad (4)$$

where:

$\underline{P}_{it}$ = The proportion of officers from source "i" remaining on active duty at the beginning of training in year "t";

$\underline{X}_{ik}$ = The number of MCA officers originally commissioned from source "i" in year "k";

$\underline{S}$ = The training cost of the basic branch course;

r = The discount rate; and

t = The number of years after year "k" in which the training occurs.

The time adjusted value at the time of commissioning of the cost of the advanced branch course for officers from source "i" may be represented as:

$$\underline{E}_i = \frac{\underline{p}_{it} \cdot \underline{X}_{ik} \cdot \underline{U}}{(1 + r)^t} \qquad (5)$$

where:

$\underline{p}_{it}$ = The proportion of officers from source "i" remaining on active duty at the beginning of training in year "t";

$\underline{X}_{ik}$ = The number of MCA officers originally commissioned from source "i" in year "k";

$\underline{U}$ = The training cost of the advanced branch course;

r = The discount rate; and

t = The number of years after year "k" in which the training occurs.

The time adjusted value at the time of commissioning of the cost of the C&GSC for officers from source "i" may be represented as:

$$\underline{F}_i = \frac{\underline{p}_{it} \cdot \underline{X}_{ik} \cdot \underline{Y}}{(1+r)^t} \qquad (6)$$

where:

$\underline{p}_{it}$ = The proportion of officers from source "i" remaining on active duty at the beginning of training in year "t";

$\underline{X}_{ik}$ = The number of MCA officers originally commissioned from source "i";

$\underline{Y}$ = The training cost of the C&GSC;

r = The discount rate; and

t = The number of years after year "k" in which the training occurs.

The time adjusted value at the time of commissioning of the cost of the AWC for officers from source "i" may be represented as:

$$\underline{H}_i = \frac{\underline{p}_{it} \cdot \underline{X}_{ik} \cdot \underline{Z}}{(1+r)^t} \qquad (7)$$

where:

$\underline{p}_{it}$ = The proportion of officers from source "i" remaining on active duty at the beginning of training in year "t";

$\underline{X}_{ik}$ = The number of MCA officers originally commissioned from source "i" in year "k";

$\underline{Z}$ = The training cost of the AWC;

r = The discount rate; and

t = The number of years after year "k" in which the training occurs.

The time adjusted value at the time of commissioning of the cost of total military compensation (base pay, cash supplements, and fringe benefits) of a cohort of officers commissioned in year "k" from source "i" may be represented as:

$$\underline{T}_{ik} = \sum_{t=1}^{30} \frac{1}{(1+r)^t} \sum_{j=1}^{10} [[\underline{p}'_{ijkt} \cdot \underline{BP}_{ijkt}]t + .041[\underline{p}'_{ijkt} \cdot \underline{BP}_{ijkt}]t + .149[\underline{p}'_{ijkt} \cdot \underline{BP}_{ijkt}]t] \quad (8)$$

where:

$\underline{p}'_{ijkt}$ = The proportion of officers commissioned from source "i" in year "k" who are at rank "j" and are in the Army at year "t";

$\underline{BP}_{ijkt}$ = The corresponding base pay of an officer commissioned from source "i" in year "k" who is at rank "j" and is in the Army at year "t";

t = The number of years after year "k" in which the base pay is received;

.041 = The fraction of base pay (decimal equivalent) represented by cash supplements [Canby, 1972];

.149 = The fraction of base pay (decimal equivalent) represented by fringe benefits [Canby, 1972];

30 = The maximum number of years of service which can be credited for pay purposes [DOD, 1969]; and

10 = The maximum pay grade an officer can hold (0-10 or general) [DOD, 1969].

The time adjusted value at the time of commissioning of the retirement annuity of a cohort of officers commissioned in year "k" from source "i" may be represented as:

$$\underline{W}_{ik} = \sum_{t=\pi_{ik}}^{98} \frac{\underline{L}_{ikt} \cdot \underline{R}_{ikt}}{(1+r)^t} \qquad (9)$$

where:

98 = The maximum age an officer may be expected to attain [AMAA, 1979];

$\underline{L}_{ikt}$ = The probability of survival in year "t" for an officer commissioned from source "i" in year "k";

$\underline{R}_{ikt}$ = The retirement pay in year "t" for a cohort of officers commissioned from source "i" in year "k";

t = The year of retirement, measured from the year of commissioning, "k";

π_{ik} = The earliest year in which an officer commissioned from source "i" in year "k" can retire (normally 20 years) [DOD, 1969];

r = The discount rate; and

k = The year of commissioning.

The retirement pay in year "t" for a cohort of officers commissioned from source "i" in year "k" may be represented as:

$$\underline{R}_{ikt} = \sum_{t'=\pi'_i}^{30} \sum_{j=1}^{10} \underline{A}_{ijktt'} \cdot \underline{G}_{ijktt'} \qquad (10)$$

where:

t' = The year of retirement, in which $t' \leq t$;

π'_i = The earliest year in which an officer from source "i" can retire (normally 20 years);

30 = The maximum number of years of service which can be credited for retirement pay purposes;

j = The rank or pay grade at retirement;

10 = The maximum pay grade an officer can hold (0-10 or general);

$\underline{A}_{ijktt'}$ = The number of officers commissioned in year "k" from source "i" and at rank "j" in year "t'", and retire in year "t"; and

$\underline{G}_{ijktt'}$ = The retirement pay of officers commissioned in year "k" from source "i" who retire at rank "j" in year "t'", and retire in year "t".

The retirement pay computation formula developed for this study for an officer commissioned in year "k" from source "i" and who retires in year "t" at rank "j" may be represented as:

$$\underline{G}_{ijktt'} = \underline{BP}_{ijktt'} \cdot .025 \cdot \underline{YR}_{ijktt'} \quad (11)$$

where:

$\underline{BP}_{ijktt'}$ = The terminal base pay of officers commissioned in year "k" from source "i" and at rank "j" in year "t'", who retire in year "t";

$\underline{YR}_{ijktt'}$ = The years of service (up to 30) for retirement of officers commissioned in year "k" from source "i" and at rank "j" in year "t'", who retire in year "t"; and

.025 = The decimal equivalent of the annuity calculation factor, which represents 2.5 percent for each year of active federal service, up to the 30 year maximum [DOD, 1969].

D. SUMMARY

The valuation model constructed here treats training and compensation costs as components of the total training investment. The benefit the Army realizes from this training

investment is the performance of the graduates of each commissioning source. The following chapter introduces data and determines the total investments in officers from each commissioning source.

IV. DATA COLLECTION AND MANIPULATION

This chapter discusses the collection of data for use in the models presented in the preceding chapter. Time adjusted values (TAV) of the costs of commissioning, continuing education and training, total military compensation, retirement annuities, and the total monetary investment in the graduates of each source are presented. Also, the total investment per graduate remaining on active duty at the end of the 20th and 25th years of active federal commissioned service is presented.

A. COHORTS SELECTED

The USMA, ROTC, and OCS cohorts that began active commissioned service in 1952 and 1954 were considered in this study. Two years were selected to permit interperiod comparisons. These particular years were selected for the following reasons: 1) they provide a record of experience past the initial voluntary retirement option at 20 years of service, 2) they provide an indication of career commitment beyond the 20-25 year retirement eligibility points when the majority of voluntary retirements occur [Official Army Register, USMA Register], 3) the similarity of external influences upon the cohorts such as economic conditions and wars, and 4) the availability of data.

B. DATA COLLECTION

1. Data Collection Procedure for USMA Graduates

A list of USMA graduates by name in calendar years 1952 and 1954 was compiled from a manual search of the 1979 USMA Register. This publication lists graduates by class and contains the present military status of each officer. If a graduate is no longer in the service, the reason (e.g., death, resignation, retirement) for departure is listed. Each name was checked against successive annual editions of the Official Army Register (OAR), beginning with the edition documenting the first year after commissioning. The search was conducted twice, with one individual conducting the first and a different individual conducting the second search. The OAR lists each active RA officer by name, grade, date of birth, date of commissioning, military education level, branch of service, Social Security Account Number (SSAN), and civilian education level. Years in which individual officers were promoted, attended formal military schooling, or departed from the Army were thus determined.

2. Data Collection Procedure for ROTC Graduates

A list of graduates by name in calendar years 1952 and 1954 was compiled from a manual search of the OAR in which graduates from each year first appeared, the 1953 edition for 1952 graduates and the 1955 edition for 1954 graduates. Successive annual editions of the OAR were then checked by two individuals to determine years in which

individual officers were promoted, attended formal military schooling, or departed from the Army.

3. Data Collection Procedure for OCS Graduates

None of the 1952 or 1954 graduates from OCS were appointed to the RA upon commissioning [DoD, 1952a, 1952b, 1954a, 1954b]; therefore, an alternative procedure for determining comparable contributions of the OCS to RA strength in 1952 and 1954 was used. Army regulations provide a process for OCS graduates with outstanding performance records to seek and obtain appointments in the RA during the years following commissioning [DoD, 1952a, 1952b; DA, 1958, 1966]. This process if termed RA integration.

RA integration could happen at any point in an officer's career; however, a specific number of years of service had to be determined as a starting point in determining the number of OCS integrations to the RA. Nineteen years of service was selected. The rationale for this selection is discussed below.

a. Opportunities for RA Integration

Opportunities for RA integration are constrained by statute. Title 10, United States Code (USC) and the Officer Grade Limitation Act (OGLA) of 1949 define the maximum RA officer strength by grade. The number of available appointments to the RA is therefore determined by the difference between the number of RA officers serving at each grade and the statutory maximum for each grade.

Since the Army officer grade structure is roughly pyramidal in shape, the opportunities for RA integration by OCS graduates necessarily diminish at higher grades and corresponding increased years of service. The final opportunity for RA integration normally occurs by the completion of the 19th year of service. The 19th year of service is also the last year prior to an officer's initial voluntary retirement opportunity, which occurs at the completion of 20 years of active federal commissioned service [DoD, 1969].

b. Selection

The 19th year of service is therefore the point at which virtually all RA integrations have occurred and the cohort strength has not been reduced by the initial voluntary retirement opportunity. Consequently, the OAR in which OCS graduates who had completed 19 years of service appeared was screened and the names of those graduates listed. Previous annual editions of the OAR were then checked by two individuals to determine the years in which these officers were promoted or attended formal military schooling. Retirement and promotion data for the 20-25th years of service were collected by checking successive annual editions of the OAR. The bias introduced by this procedure is discussed below.

4. Results of Data Collection

The number of officers commissioned from each source in 1952 and 1954 is shown in Table 2. The number of officers from each source who remained on active duty at the completion of 20 and 25 years of service is shown in Tables 3 and 4, respectively.

Table 2

Number of Regular Army Officers Commissioned

	Year of Commissioning		
Source	1952	1954	Total
USMA	307	543	850
ROTC	492	193	685
OCS	243	186	429
TOTAL	1,042	922	1,964

Table 3

Number of Officers Remaining On
Active Duty At the End Of 20 Years Of Service

	Year of Commissioning		
Source	1952	1954	Total
USMA	186	212	398
ROTC	208	102	310
OCS	243	186	429
TOTAL	637	500	1,137

Table 4

Number of Officers Remaining On
Active Duty At The End Of 25 Years Of Service

	Year of Commissioning		
Source	1952	1954	Total
USMA	79	93	172
ROTC	64	43	107
OCS	52	86	138
TOTAL	195	222	417

The number of officers commissioned in the MCA from OCS in 1952 and 1954 was approximately 2,100 and 800, respectively [DoD, 1952a, 1952b, 1954a, 1954b]. Due to the large number of MCA officers commissioned from OCS compared to the much smaller number who were later appointed to the RA, the number of officers from this source used as input for the investment models will bias the results. This bias is caused by not counting the number of officers from OCS who were either not appointed to the RA or who were appointed to the RA but left the Army prior to the completion of their 19th year of service. The effect of this bias is an understatement of the total amounts of the investments incurred by the Army to obtain an officer from the OCS.

The ranks of the officers from each source who were on active duty at the end of the 20th and 25th years of service are shown in Tables 5, 6, and 7.

Table 5

Ranks of USMA Officers on Active Duty At The End of 20 and 25 Years of Service

	1952		1954	
Rank	20 YOS	25 YOS	20 YOS	25 YOS
Major (0-4)	2	0	3	0
Lieutenant Colonel (0-5)	184	7	119	17
Colonel (0-6)	0	64	78	62
Brigadier General (0-7)	0	6	0	13
Major General (0-8)	0	2	0	1
TOTAL	186	79	212	93

Table 6

Ranks of ROTC Officers on Active Duty at the End of 20 and 25 Years of Service

	1952		1954	
Rank	20 YOS	25 YOS	20 YOS	25 YOS
Major (0-4)	6	0	6	0
Lieutenant Colonel (0-5)	122	16	94	1
Colonel (0-6)	80	43	2	40
Brigadier General (0-7)	0	4	0	2
Major General (0-8)	0	1	0	0
TOTAL	208	64	102	43

Table 7

Ranks of OCS Officers on Active Duty at the End of 20 and 25 Years of Service

	1952		1954	
Rank	20 YOS	25 YOS	20 YOS	25 YOS
Major (0-4)	3	0	3	0
Lieutenant Colonel (0-5)	206	7	179	22
Colonel (0-6)	34	43	4	61
Brigadier General (0-7)	0	2	0	3
Major General (0-8)	0	0	0	0
TOTAL	243	52	186	86

The tables indicate that officers commissioned from the USMA generally attain higher rank than their counterparts commissioned from either the ROTC or OCS. Moreover, USMA graduates commissioned were more successful in attaining general officer rank (Brigadier and Major General) than the officers commissioned from any other source.

C. DATA MANIPULATION

The personnel data for each commissioning source were arrayed in a two-dimensional matrix. The matrix indexed the number of officers in the Army at each grade at the end of a given year of service. A second two-dimensional matrix indexed the number of officers who retired at each grade at the end of a given year of service. Use of the matrices organized the personnel data into a format which facilitated the calculation of monetary investment amounts. The discount rate used throughout the financial calculations was ten percent, as established by Department of Defense (DoD) Instruction 7041.3.

The total time adjusted investment at the time of commissioning incurred by the Army for each cohort are expressed in the following terms: 1) the total cost allocated equally among the number of officers who were commissioned from a source, expressed as the cost per graduate; and 2) the total cost allocated equally among the number of officers remaining on active duty at the end of the 20th and 25th years of service, expressed as the cost per officer. This arrangement

permits a uniform comparison of the investments in each cohort at specific points in time. These monetary investment amounts are shown below.

1. Commissioning Cost

Table 8 shows the estimated cost of commissioning an officer from each source in Fiscal Year (FY) 1980.

Table 8

Commissioning Cost Per Graduate

Source	Cost
USMA	$116,830
ROTC	17,085
OCS	11,293

Source. Precommissioning Program Branch, Officer Division, Office of the DCSPERS, DA, 1979.

Table 8 shows the comparatively high cost incurred by the Army in commissioning an officer from the USMA and the relative economy in commissioning an officer from the OCS.

2. Continuing Education and Training Cost

Inputting the data collected for this study into the Continuing Education and Training Cost equation (3) and allocating the costs among graduates produced the amounts shown in Table 9.

Table 9

Time Adjusted Value Of Continuing Education And Training Cost, Q_{ik}, Per Graduate

Source	1952 Cost Per Graduate	1954 Cost Per Graduate
USMA	$7,662	$4,412
ROTC	14,354	14,398
OCS	7,880	11,884

Neither USMA nor OCS graduates commissioned in 1952 and 1954 attended basic branch courses [DA, 1958, 1966]; however, all of the ROTC graduates commissioned in those years attended a basic branch course. This is reflected in the comparatively higher cost shown for each ROTC graduate commissioned in 1952 and 1954. Allocating the costs of continuing education and training among the officers from each source who remained in the Army for a 20 year career produced the amounts shown in Table 10. Table 10 reflects the effects of officer attrition. Officers from the USMA and ROTC who attended formal military schooling but left the Army prior to the end of their 20th year of service increased the amount of the total investment, while reducing the final number of officers among whom the investment could be allocated. This factor was not present in computing the amounts for OCS officers because the manner in which OCS officers were counted excluded

Table 10

Time Adjusted Value Of Continuing Education And Training Cost, Q_{ik}, Per Officer Remaining On Active Duty At The End Of 20 Years Of Service

	1952	1954
Source	Cost Per Officer	Cost Per Officer
USMA	$12,646	$11,300
ROTC	33,953	27,243
OCS	7,880	11,884

attrition for the first 19 years of service. The comparatively higher amounts shown for ROTC officers are also attributable to the higher costs incurred as a result of their attendance at basic branch courses in the first year after commissioning.

Allocating the costs of continuing education and training among the officers from each source who remained in the Army for a 25 year career produced the amounts shown in Table 11. Table 11 shows the effects of officers from all three sources who left the Army prior to completion of their 25th year of service. The higher costs incurred as a result of ROTC officer attendance at basic branch courses and the higher proportion of officers originally commissioned from that source who did not remain in the Army for 25 years are also reflected in the figures. The introduction of attrition data for OCS graduates who left the Army between their 20th

Table 11

Time Adjusted Value Of Continuing Education And Training Cost, Q_{ik}, Per Officer Remaining On Active Duty At The End Of 25 Years Of Service

	1952	1954
Source	Cost Per Officer	Cost Per Officer
USMA	$29,775	$25,760
ROTC	110,347	64,623
OCS	36,824	25,704

and 25th years of service are reflected in the greater amounts shown for OCS officers commissioned in 1952 relative to their USMA counterparts commissioned in that year.

3. Cost of Total Military Compensation

Inputting the data collected for this study into the Cost of Total Military Compensation equation (8) and allocating the costs among the graduates produced the amounts shown in Table 12.

Table 12

Time Adjusted Value Of Total Military Compensation, T_{ik}, Per Graduate

	1952	1954
Source	Cost Per Graduate	Cost Per Graduate
USMA	$141,788	$ 97,138
ROTC	152,967	149,752
OCS	182,669	178,917

Table 12 shows that by allocating the costs among graduates, the figures for OCS officers are greater than for either the USMA or ROTC. This is attributable to the manner in which OCS officers were counted, which excluded attrition for the first 19 years of service. None of the OCS officers were considered to have left the Army prior to their initial retirement eligibility; the decrease in investment due to attrition reflected in the amounts shown for other sources in absent. Consequently, the number of officers for whom the costs of total military compensation were computed is the same at each grade for the first 19 years of service.

Allocating the costs of total military compensation among the officers from each source who remained in the Army for a 20 year career produced the amounts shown in Table 13.

Table 13

Time Adjusted Value Of Total Military Compensation, T_{ik}, Per Officer Remaining On Active Duty At The End Of 20 Years Of Service

	1952	1954
Source	Cost Per Officer	Cost Per Officer
USMA	$234,026	$248,800
ROTC	361,825	283,355
OCS	182,669	178,917

Table 13 reflects the effects of officer attrition. Officers from the USMA and ROTC who received compensation but left the Army prior to the end of their 20th year of service increased the amount of the total investment, while reducing the final number of officers among whom the investment could be allocated. This factor was not present in computing the amounts for OCS officers because the manner in which OCS officers were counted excluded attrition for the first 19 years of service. A comparison of the figures for USMA and ROTC graduates shows that the cost per ROTC officer was greater for both 1952 and 1954 graduates.

Allocating the costs of total military compensation among officers from each source who remained in the Army for a 25 year career produced the amounts shown in Table 14.

Table 14

Time Adjusted Value Of Total Military Compensation, T_{ik}, Per Officer Remaining On Active Duty At The End Of 25 Years Of Service

	1952	1954
Source	Cost Per Officer	Cost Per Officer
USMA	$550,997	$567,158
ROTC	1,175,932	672,144
OCS	853,628	386,959

Table 14 shows the effects of officers from all three sources who left the Army prior to completion of their 25th year of service. The cost for ROTC officers remains comparatively higher than for the officers from any other source. Additionally, the cost per OCS officer commissioned in 1952 increased from the 20th to the 25th year.

4. Retirement Annuity

Inputting the data collected for this study into the Retirement Annuity equation (9) and allocating the costs among the graduates produced the amounts shown in Table 15. The AMAA mortality tables used in the calculations were based on a retirement age of 43 years at the completion of 20 years of service [AMAA, 1979].

Table 15

Time Adjusted Value Of Retirement Annuity, W_{ik}, Per Graduate

	1952	1954
Source	Cost Per Graduate	Cost Per Graduate
USMA	$13,425	$ 9,460
ROTC	10,318	12,244
OCS	28,877	24,099

The amounts shown in Table 15 are a direct result of the number of officers who remain in the Army until their retirement eligibility and actually retire. Because an officer's

retirement annuity increases with the rank and number of years of service completed at the time of retirement, the grades and years of service at which these officers retire is reflected in the amounts shown.

The comparatively higher amounts for OCS graduates are the result of the greater proportion of officers from that source who remained in the Army at the time of their initial voluntary retirement opportunity, compared to the number who were considered to have been originally commissioned. The effects of this procedural data collection bias are reduced when comparisons at the end of 20 years of service are examined in Table 16.

Table 16

Time Adjusted Value Of Retirement Annuity, W_{ik}, Per Officer Remaining On Active Duty At The End Of 20 Years Of Service

	1952	1954
Source	Cost Per Officer	Cost Per Officer
USMA	$22,158	$24,230
ROTC	24,406	23,168
OCS	28,877	24,099

Table 16 shows a comparison between the three sources at the 20th year of service. The effects of USMA and ROTC officer attrition in the first 19 years of service reduced the number

of officers among whom the total amount of retirement annuities were allocated, which increased the amounts per officer.

As the effects of officer attrition due to retirement during the 20th through the 25th years reduced the number of officers among whom the total amount of the retirement annuities could be allocated, the figures shown in Table 17 emerged.

Table 17

Time Adjusted Value Of Retirement Annuity, W_{ik}, Per Officer Remaining On Active Duty At The End Of 25 Years Of Service

	1952	1954
Source	Cost Per Officer	Cost Per Officer
USMA	$52,172	$55,233
ROTC	79,321	54,956
OCS	134,945	52,122

Table 17 shows an increase in the cost per OCS officer commissioned in 1952 who remained at the end of the 25th year of service.

5. Total Investment

Inputting the data collected for this study into the Total Investment equation (1) and allocating the costs among the graduates produced the amounts shown in Table 18. Table 18 shows that the total investment per graduate is greater for officers commissioned from the USMA than for officers commissioned from other sources.

Table 18

Time Adjusted Value Of Total Investment, I_{ik}, Per Graduate

	1952	1954
Source	Cost Per Graduate	Cost Per Graduate
USMA	$279,705	$227,839
ROTC	194,724	193,479
OCS	230,720	226,193

The allocation of the Army's monetary investment among individual officers who remained in the Army until the end of their 20th year of service is shown in Table 19. The

Table 19

Time Adjusted Value Of Total Investment, I_{ik}, Per Officer Remaining On Active Duty At The End Of 20 Years Of Service

	1952	1954
Source	Cost Per Officer	Cost Per Officer
USMA	$461,663	$583,569
ROTC	460,597	366,093
OCS	230,720	226,193

investment amount per graduate is influenced by the number of officers from a source who leave the Army before attaining 20 years of service. Consequently, as the number of officers

from a given source remaining on active duty declines during the first 20 years of service, the investment allocated to those who complete 20 years increases. Table 19 shows that the total investment per officer is greater for officers commissioned from the USMA than for officers commissioned from other sources.

The allocation of the Army's monetary investment among individual officers who remained in the Army beyond their first six retirement opportunities during the 20th through 25th years of service is shown in Table 20.

Table 20

Time Adjusted Value Of Total Investment, I_{ik}, Per Officer Remaining On Active Duty At The End Of 25 Years Of Service

	1952	1954
Source	Cost Per Officer	Cost Per Officer
USMA	$1,086,954	$1,330,287
ROTC	1,496,940	868,406
OCS	1,078,170	489,209

Table 20 shows that the total investment per officer is greater for officers commissioned from the USMA in 1954 than for other sources. For officers commissioned in 1952, the ROTC showed a higher investment amount per officer than the other sources.

The results of the calculations shown in Tables 19 and 20 suggest the relative economy of the OCS in producing career officers; however, the possible downward bias introduced by the manner in which OCS graduate data were compiled must also be considered. The possible effects of this bias are discussed in detail in the following chapter.

D. SUMMARY OF FINDINGS

Operationalization of the HRA valuation model developed in the preceding chapter produced the monetary amount of the Army's total training investment. The results showed that the officers commissioned from the USMA in 1954 who remained in the Army past their 25th year of service received a larger monetary investment per officer than the officers from other sources. For officers commissioned in 1952, the results showed that the officers commissioned from the ROTC who remained in the Army past their 25th year of service received a larger monetary investment per officer than the officers from other sources. Chapter IV presents a more detailed interpretation and summary of the results and discusses the implications of this study's findings.

V. SUMMARY AND CONCLUSIONS

This chapter reviews the purpose of this study, presents a general summary of the results, discusses the degree to which the results achieved the study objectives and presents implications for additional research.

A. STUDY OBJECTIVES

The purpose of this study was to demonstrate the relative effectiveness of the three major RA commissioning training sources based on the performance of the graduates of each source.

B. RESEARCH RESULTS

Previous studies [Canby, 1972; Ellis and Moore, 1974; Galloway and Johnson, 1973; GAO, 1975; Glick, 1971; and Heise, 1969] have focused on the costs of commissioning an officer from the USMA and compared them to the costs of commissioning an officer from either the ROTC or OCS. This study was used to conduct a similar analysis; however, a larger investment base was utilized to evaluate the commissioning alternatives. The total investment in the officers commissioned from each source was allocated among the officers who completed 20 and 25 years of active federal commissioned service.

The conclusions drawn from and the limitations inherent in the study are discussed below.

1. Study Findings

a. Findings at the Time of Commissioning

The calculations indicate that officers who were commissioned from the USMA in 1952 and 1954 represented a higher total investment per graduate than the officers commissioned from any other source. This finding is consistent with the conclusions of the earlier studies, which limited their analysis to the comparative commissioning costs per graduate.

b. Findings at 20 Years of Service

The calculations for officers who remained in the Army until their initial voluntary retirement opportunities at 20 years of service revealed that an officer commissioned from the USMA represented a greater investment than an officer commissioned from eithter the ROTC or OCS. The 20 year investment figure was influenced by the number of graduates from a particular source who were originally commissioned but left the Army prior to the completion of 20 years of service. These officers increased the amount of the total investment while remaining on active duty. Their departure prior to the completion of their 20th year of service, however, reduced the number of officers among whom the total investment could be allocated.

The apparently less costly figures for officers commissioned from the OCS must be interpreted in light of the manner in which the data were collected. The data for the USMA and ROTC were based on only the number of RA officers

commissioned from those sources. None of the OCS officers were appointed in the RA at the time of their commissioning; therefore, an alternative means of identifying RA officers was used. The number of officers commissioned from the OCS who were integrated into the RA during their first 19 years of service were counted. Consequently, the investments in non-RA officers commissioned from the OCS were not considered, nor were the investments in OCS officers who were appointed to the RA but left the Army prior to the completion of their 19th year of service. This study, therefore, did not consider any costs incurred by OCS officers who failed to complete 19 years of service. This tended to ascribe greater cost efficiency to the OCS commissioning source than would be justifiable if all OCS graduates had been considered. The results of this bias are less evident in the calculations shown for officers who completed 25 years of service, because of the effects of the attrition introduced by the retirement of officers commissioned from the OCS as well as those commissioned from the USMA and ROTC.

The findings at 20 years of service indicate that the USMA was a more costly source in commissioning officers who remained in the Army until the completion of 20 years of service than the ROTC.

c. Findings at 25 Years of Service

The investment per officer for those who completed 25 years of service reveals the effects of the first six voluntary retirement opportunities on the number of officers

who completed 20 years of service. The figures show that the investment in the USMA officers who were commissioned in 1954 and remained on active duty after the completion of 25 years of service is greater per officer than for any other commissioning source. Additionally, the OCS offered the least costly investment per officer who remained on active duty for the same period of time.

The difference in the investments per officer for those commissioned in 1952 is less dramatic. The figures indicate that the money invested in the ROTC officers who were commissioned in 1952 and remained on active duty after the completion of 25 years of service is greater per officer than for any other commissioning source. Moreover, the OCS officers commissioned in 1952 show the lowest per-officer investment.

The criterion for commissioning source effectiveness used in this study is the attainment of desired performance by the graduates of each source, as determined by graduate retention and promotion. Applying that criterion to the investments in the graduates of each source, it is apparent that the USMA offered the lowest relative return on the investment in human resources for officers commissioned in 1954. For officers commissioned in 1952, the ROTC offered the lowest relative return on the investments in human resources. Concomittantly, the OCS offered the highest return on that investment for officers commissioned in both years.

d. Analysis of the Findings

The disparity in the results between the investment per officer who completed 20 years of service and the investment per officer who completed 25 years of service is primarily attributable to the rate at which officers from a particular source retired between the 20th and 25th years of service. The 20 year results indicate that the officers from the USMA who were commissioned in 1952 represented a slightly higher investment per officer than did their ROTC counterparts. The 25 year results, however, indicate that the costs per officer commissioned from the ROTC were substantially higher than for those commissioned from the USMA. A comparison of Tables 3 and 4 reveals that 57 percent of the USMA officers commissioned in 1952 retired; while 69 percent of the ROTC officers commissioned in that year retired between the end of the 20th and 25th years of service. There were, therefore, proportionately fewer ROTC officers remaining at the end of 25 years of service among whom the total investment could be allocated.

The effects of retirement attrition may also be seen when the 20 and 25 year USMA and ROTC results are compared for officers commissioned in 1954. The figures indicate that 44 percent of the USMA officers retired in those years; while 42 percent of their ROTC counterparts retired during the same period. Equalizing the number of officers commissioned from the USMA with the number of ROTC officers

commissioned in the same year, the figures indicate that the ROTC provides a more economical source of RA officers when a comparable number of officers are commissioned and the attrition rates are similar. Similar attrition rates are a necessary assumption for the sake of this analysis. Further analysis may indicate that ROTC graduates do, in fact, experience a consistently higher attrition rate. Moreover, the figures imply that when a comparable number of officers are commissioned, the ROTC is more economical even when ROTC officers leave the Army at a slightly higher rate. The results of this study are, therefore, mixed; however, given specific assumptions, the ROTC was a more effective means of RA officer production, in economic terms, for 20 and 25 year careers than the USMA. When comparing the ROTC and the OCS, the ROTC does not provide as economically effective a source for RA officers as the OCS; however, the effects of the bias introduced by the data collection procedure for OCS officers must also be considered.

2. Recommendations

The analysis of this study further suggests that the Army should devote more resources to the ROTC program with the goal of commissioning more RA Maneuver Combat Arms (MCA) officers from that source and proportionately fewer from the USMA.

C. CONSTRAINTS ON GENERALIZATION

This study considered the relative return on the Army's investment in the human resources commissioned from the three primary RA MCA commissioning sources. It concluded that the OCS offered the highest relative return on that investment and the USMA the lowest. These conclusions, however, must be considered in light of the limitations of the study.

1. Scope

This study considered only two representative years of commissioning source experience, 1952 and 1954. It is possible that a more detailed study including more years of commissioning source experience would provide different results due to a larger basis for comparison.

2. Data Limitations

The data for this study were gathered by a manual search of the USMA Register and the OAR. Errors in transcription may have occurred in the process of recording the career information of the graduates of each source, even though the data were checked for such errors. Of potentially more significance is the bias introduced by the manner in which OCS data were treated. A source of potential lost investment is represented by OCS officers who were appointed in the RA after commissioning but left the Army prior to the completion of 19 years of service, and by OCS officers who were commissioned but were never appointed to the RA. The effect of this bias is an understatement of the total investment amounts allocated to the officers who were counted,

because the effects of lost investment due to attrition were not considered. Consequently, the investment amounts allocated to the OCS officers who were counted at the end of their 19th year of service represent investments received only by those officers who were counted. An examination of the gross number of officers commissioned from the OCS in 1952, and its effect on the per officer allocation at the end of the 25th year of service, indicates that the OCS officers represented investments only slightly below that for the ROTC officers, and substantially below that for the USMA officers. An examination of the comparable figures for OCS officers commissioned in 1954, who showed a substantially lower proportion of retirements than did the officers commissioned from any other source, suggests the relative conomy of the OCS in producing officers, but only at particularly advantageous (lower) rates of retirement.

3. Measurement

Commissioning source effectiveness was measured by the number of officers commissioned from each source who remained in the Army beyond the 25th year of service. While this provides an indicator of commissioning source effectiveness, it does not measure the contributions of a source's graduates to national defense. It does not therefore, differentiate between officers of the same grade who receive identical military compensation but whose jobs entail different degrees of responsibility. Inasmuchas this condition may exist, the development of such a metric could enable the Army

to determine grade requirements for specific duty positions at DA and DoD level organizations and eliminate or downgrade those positions which currently require officers of higher military rank and experience than actually justified. Conversely, such a technique may identify positions which should be added or upgraded to require officers of higher military rank and experience than currently authorized. Requirements could then be forecast on a more economical basis in terms of the training required to actually discharge the duties of such positions.

D. IMPLICATIONS FOR ADDITIONAL RESEARCH

This research was limited to an examination of the investments in human resources provided by the Army in terms of the RA MCA officers commissioned from the three major officer commissioning sources. Additional applications of HRA are examined below.

First, the HRA method could be applied to a study which considers a longer period of commissioning source experience. The mixed results of this study indicated that some commissioning sources were more economical than others in a particular year of consideration. A study which considers a larger sample of experience in its analysis may provide more definite results.

Second, the HRA method could be applied to the construction of cost models designed to determine an optimal accession mix for future officer and enlisted soldier procurement. In

this manner, the Army, using probabilistic modeling techniques, could accurately forecast its officer and enlisted requirements based on budgetary constraints and the expected retention and investments required to support such a force and the necessary training base.

A third possibility is the use of HRA in forecasting the investments required to sustain the enlisted soldier specialty training and reenlistment requirements based on the costs and retention probabilities of enlisted soldiers. For example, the amount of the training investment made in soldiers in highly technical specialties could be considered the replacement cost of such soldiers when they leave the Army. Monetary reenlistment bonuses could then be geared to the savings realized by retaining a soldier in the Army rather than recruiting and training a replacement for that soldier.

Additionally, HRA could be used to demonstrate the loss in human resources which occur as the result of Congressionally-mandated reductions in force (RIF). HRA could be used to identify areas of false economy when trained, experienced personnel are lost to the Army and their replacements must be recruited, trained, and compensated.

E. SUMMARY

This chapter examined the effectiveness of the USMA, ROTC and OCS in producing RA MCA officers based on the relative return on the investment in the graduates of each source who remained in the Army for 20 and 25 year careers. The results

of the study were mixed. The results indicated that some commissioning sources were more economical than others in a particular year. However, given specific assumptions, the ROTC offerred the highest relative return for the cohorts considered.

The HRVM used used in this study offers a useful technique to financial and personnel managers for the maximization of the return on the Army's substantial investments in human resources.

BIBLIOGRAPHY

Alexander, M.O. Investments in People. As cited by Ogan, P. Application of a human resource value model: a field study. Accounting, Organizations, and Society, 1976, 1 (2-3), 195-217.

American Accounting Association. Report of the committee on human resource accounting. Contemporary issues in cost and managerial accounting, a discipline in transition (3d ed.). Anton, Firmin and Grove (Eds.). Boston: Houghton Mifflin, 1978.

Becker, G.S. Human capital. As cited in Human resource accounting: past, present and future. E.H. Caplan and S. Landekich (Eds.). New York: National Association of Accountants, July, 1974.

Brummet, R.L., Pyle, W.C., & Flamholtz, E.G. Human resource measurement - a challenge for accountants. The Accounting Review, April 1968, 20-25.

Brummet, R.L., Pyle, W.C., & Flamholtz, E.G. Human resource accounting: a tool to increase managerial effectiveness. Management Accounting, August 1969, 12-15.

Canby, S.L. Military manpower procurement. Lexington, MA: D.C. Heath, 1972.

Carper, W.B. An Inquiry into the Nature of Accounting for Human Resources and its Feasibility for CPA Firms. (Unpublished PhD dissertation, University of Alabama, 1973). As cited in Ogan, P. Application of a human resource value model: a field study. Organizations, Accounting, and Society, 1976 1 (2-3), 195-217.

CRC standard mathematical tables. Cleveland: Chemical Rubber Col, 1964.

Defense Manpower Commission. Defense manpower commission staff studies and supporting papers (5 vols.). Washington, D.C.: Author, 1976.

Denison, Edward F. The sources of economic growth in the united states and the alternatives before us. New York: Committee for Economic Development, 1962.

Ellis, J.P. & Moore, R. West point and the profession of arms. New York: Oxford University Press, 1974.

Fisher, I. As cited in Schultz, T.W. Investment in human capital. New York: Free Press, 1971.

Flamholtz, E.G. Toward a theory of human resource value in formal organizations. The Accounting Review. April, 1972, 32-37.

Flamholtz, E.G. Human resource accounting: measuring positional replacement costs. Human Resource Management, Spring, 1973, 14-21.

Flamholtz, E.G. Human resource accounting. Encino, CA: Dickenson, 1974.

Flamholtz, E.G. & Lundy, T.S. Human resource accounting for cpa firms. CPA Journal, 1975, 45, 45-51.

Galloway, K.B. & Johnson, R.B., Jr. West point - america's power fraternity. New York: Simon and Schuster, 1973.

Glick, E.B. Soldiers, scholars and society. Pacific Palisades, CA: Goodyear, 1971.

Hanst, K.F. Letter to the author. October 18, 1979.

Heise, J.A. The brass factories. Washington, D.C.: Public Affairs Press, 1969.

Hekimian, J.S. & Jones, C.H. Put people on your balance sheet. Harvard Business Review, Jan-Feb, 1967, 105-113.

Kendrick, J.W. Productivity trends in the united states. Princeton, NJ: Princeton University Press, 1961.

Knight, F. Diminishing returns to investment. Journal of Political Economy. As cited in Schultz, T.W. Investment in human capital. New York: Free Press, 1971.

Likert, R. Measuring organizational performance. Harvard Business Review, Mar-Apr, 1958, 58-66.

Mincer, J. Investments in human capital and personal income distribution. Journal of Political Economy. As cited in Blinder, A. On dogmatism in human capital theory. Journal of Human Resources, 1975, 8-22.

Ogan, P. A human resource value model for professional service organizations. The Accounting Review, April 1976, 1, (2-3), 195-217.

Puett, J.F. & Roman, D.D. The human resource asset. Management International Review, February 1976, 47-60.

Ricardo, D. On the principles of political economy and taxation. (P. Sraffa, Ed.). New York: Cambridge University Press, 1962. (Originally published, 1817).

Smith, A. An inquiry into the nature and causes of the wealth of nations. (C.J. Bullock, Ed.). New York: P.F. Collier and Son Corporation, 1937. (Originally published, 1776).

U.S. Department of the Army. Official army register. (Editions 1953-79). Washington, D.C.: Author, 1953-79.

U.S. Department of the Army. Report of the department of the army officer education and training review board. Washington, D.C.: Author, 1958.

U.S. Department of the Army. Report of the department of the army board to review army officer schools. Washington, D.C.: Author, 1966.

U.S. Department of the Army. Personnel evaluation reports - officer evaluation reporting system (AR 623-105). Washington, D.C.: Author, 1979.

U.S. Department of Defense. Semiannual report of the secretary of defense and the semiannual reports of the secretary of the army, secretary of the navy, secretary of the air force; January 1 to June 30, 1952. Washington, D.C.: U.S. Government Printing Office, 1952.

U.S. Department of Defense. Semiannual report of the secretary of defense and the semiannual reports of the secretary of the army, secretary of the navy, secretary of the air force; July 1 to December 31, 1952. Washington, D.C.: U.S. Government Printing Office, 1952.

U.S. Department of Defense. Semiannual report of the secretary of defense and the semiannual reports of the secretary of the army, secretary of the navy, secretary of the air force; January 1 to June 30, 1954. Washington, D.C.: U.S. Government Printing Office, 1954.

U.S. Department of Defense. Semiannual report of the secretary of defense and the semiannual reports of the secretary of the army, secretary of the navy, secretary of the air force; July 1 to December 31, 1954. Washington, D.C.: U.S. Government Printing Office, 1954.

U.S. General Accounting Office. Report to the congress by the comptroller general of the united states: academic and military programs of the five service academies. Washington, D.C.: Author, 1975.

U.S. House of Representatives. Problems in the administration of the military service academies. Washington, D.C.: U.S. Government Printing Office, 1976.

U.S. Military Academy, Association of Graduates. Register of graduates, usma (1979). West Point, N.Y.: Author, 1979.

Vroom, V.H. Work and motivation. New York: John Wiley & Sons, Inc., 1964.

The World Almanac. The world almanac and book of facts. New York: Newspaper Enterprise Association, Inc., 1978.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Defense Technical Information Center Cameron Station Alexandria, Virginia 22314	2
2.	Library, Code 0142 Naval Postgraduate School Monterey, California 93940	2
3.	Defense Logistics Studies Information Exchange U.S. Army Logistics Management Center Fort Lee, Virginia 23801	1
4.	Department Chairman, Code 54 Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
5.	DCNO (MPT) ATTN: OP-OIE Navy Annex Washington, D.C. 20370	1
6.	Professor Kenneth J. Euske, Code 54Ee Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
7.	Professor Richard S. Elster, Code 54Ea Department of Administrative Sciences Naval Postgraduate School Monterey, California 93940	1
8.	MAJ Clifford T. Rock, Jr., USA 1450 Paradise Hill Road Clarksville, Tennessee 37040	1